



**U.S. House of Representatives**  
**Committee on Transportation and Infrastructure**

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**September 4, 2007**

**James W. Coon II, Republican Chief of Staff**

**SUMMARY OF SUBJECT MATTER**

**TO:** Members of the Committee on Transportation and Infrastructure

**FROM:** Subcommittee on Highways and Transit Staff

**SUBJECT:** Hearing on "Structurally Deficient Bridges in the United States"

**PURPOSE OF HEARING**

The Committee on Transportation and Infrastructure is scheduled to meet on Wednesday, September 5, 2007, at 10:00 a.m., to receive testimony regarding structurally deficient bridges on the National Highway System. Witnesses scheduled to testify include the U.S. Secretary of Transportation, Mayor Rybak of Minneapolis, Minnesota, state departments of transportation, county engineers, and stakeholder groups.

**BACKGROUND**

**I-35W MISSISSIPPI RIVER BRIDGE**

At 6:05 p.m. on August 1, 2007, the I-35W Bridge in Minneapolis, Minnesota, collapsed into the Mississippi River, killing 13 people. The eight-lane, steel truss bridge span, which was constructed in 1967, carried approximately 140,000 vehicles daily. The National Transportation Safety Board is conducting an investigation into the cause of the collapse. The investigation may take up to 18 months to complete.

In response to concerns over the design of the bridge, U.S. Secretary of Transportation Mary Peters requested that States inspect 756 bridges with a similar steel arch truss design.

It has been widely reported that inspections of the I-35W Bridge raised significant structural concerns with the facility. The bridge had been rated as structurally deficient since 1990, and had undergone annual inspections by the Minnesota Department of Transportation ("MnDOT") since 1993.

The most recent inspection completed in June 2006 found cracking and fatigue problems, and gave the bridge a sufficiency rating of 50 percent on a scale of 0 to 100 percent. A rating of 50 percent or lower means the bridge should be considered for replacement.

In December 2006, the bridge was to have undergone a \$1.5 million steel reinforcement project to strengthen the bridge. However, MnDOT cancelled the project because of concerns that drilling for the retrofit could weaken the bridge. Alternatively, MnDOT implemented a program of periodic inspections to monitor the bridge.

#### HIGHWAY BRIDGE CONDITIONS IN THE UNITED STATES

According to the U.S. Department of Transportation ("DOT"), one of every eight bridges in the nation is structurally deficient. Of the 597,340 bridges in the United States, 154,101 bridges are deficient, including 73,784 structurally deficient bridges and 80,317 functionally obsolete bridges.

According to DOT, more than \$65 billion could be invested immediately in a cost-beneficial way, by all levels of government, to replace or otherwise address existing bridge deficiencies.<sup>1</sup>

The high percentage of deficient bridges and the large existing backlog are, in part, due to the age of the network. One-half of all bridges in the United States were built before 1964. Interstate System bridges, which were primarily constructed in the 1960s, pose a special challenge because a large percentage of these bridges are in the same period of their service lives (e.g., 44 percent of these bridges were constructed in the 1960s). Concrete and steel superstructures on the Interstate Highway System are, on average, 35 to 40 years old.

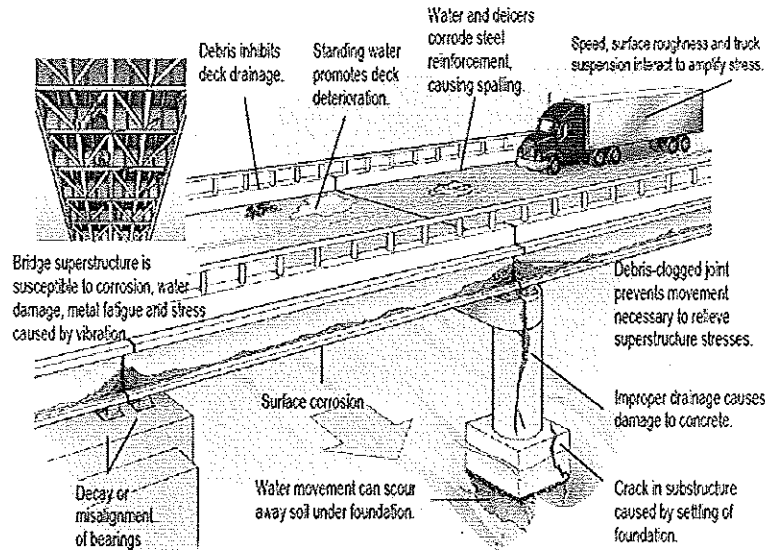
Bridges are considered structurally deficient if significant load-carrying elements are found to be in poor or worse condition due to deterioration and/or damage. The fact that a bridge is "deficient" does not immediately imply that it is likely to collapse or that it is unsafe. With hands-on inspection, unsafe conditions may be identified and, if the bridge is determined to be unsafe, the structure must be closed. A "deficient" bridge, when left open to traffic, typically requires significant maintenance and repair to remain in service and eventual rehabilitation or replacement to address deficiencies.

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<sup>1</sup> U.S. Department of Transportation, *2006 Status of the Nation's Highways, Bridges, and Transit: Conditions & Performance*, January 22, 2007, p. 7-17. The economic backlog of bridge deficiencies consists of all improvements to bridge elements that would be justified on both engineering and economic grounds. It includes improvements on bridges that warrant repair but whose overall condition is not sufficiently deteriorated for the bridges to be classified as structurally deficient. *Id.*, p. 7-16.

In a 2006 audit of structurally deficient bridges on the National Highway System, the DOT Inspector General (“IG”) illustrated common causes of structural deficiency.<sup>2</sup>

### HOW BRIDGES BECOME STRUCTURALLY DEFICIENT



Source: Illustration by Jana Brenning. Copyright Jana Brenning. Reprinted with permission. Illustration first appeared in Scientific American, March 1993.

The primary considerations in classifying structural deficiencies are the bridge component conditional ratings. The National Bridge Inventory contains ratings on the three primary components of a bridge: the deck, superstructure, and substructure. Bridge inspectors assign condition ratings by evaluating the severity of the deterioration or disrepair and the extent that it has spread through the component being rated.<sup>3</sup> Condition ratings of 4 and below indicate poor or worse conditions and result in structural deficiencies.

<sup>2</sup> U.S. Department of Transportation Inspector General, *Audit of Oversight of Load Ratings and Postings on Structurally Deficient Bridges on the National Highway System*, MH-2006-043, March 21, 2006, p. 2.

<sup>3</sup> The condition ratings provide an overall characterization of the general condition of the entire component being rated and an indication of localized conditions.

Bridge Condition Rating Categories<sup>4</sup>

Rating	Condition Category	Description
9	Excellent	
8	Very Good	
7	Good	No problems noted.
6	Satisfactory	Some minor problems.
5	Fair	All primary structural elements are sound but may have minor section loss, cracking, spalling, or scour.
4	Poor	Advanced section loss, deterioration, spalling, or scour.
3	Serious	Loss of section, deterioration, spalling, or scour have seriously affected the primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.
2	Critical	Advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may be removed substructure support. Unless closely monitored, it may be necessary to close the bridge until corrective action is taken.
1	Imminent Failure	Major deterioration or section loss present in critical structural components, or obvious loss present in critical structural components, or obvious vertical or horizontal movement affecting structural stability. Bridge is closed to traffic, but corrective action may put back in light service.
0	Failed	Out of service; beyond corrective action.

#### NATIONAL HIGHWAY SYSTEM BRIDGES

The National Highway System (“NHS”) is a 162,000-mile highway network that consists of the 46,747-mile Interstate System, the Strategic Highway Network for military mobilizations, and other major highways. While the NHS makes up only 4.1 percent of total U.S. mileage, it carries 45 percent of vehicle miles traveled, including 75 percent of heavy truck traffic and 90 percent of tourist traffic.

<sup>4</sup> U.S. Department of Transportation, *2006 Status of the Nation's Highways, Bridges, and Transit: Conditions & Performance*, January 22, 2007, Exhibit 3-9.

NHS bridges carry an even greater percentage of total travel. NHS bridges carry more than 70 percent of all traffic on bridges. Of the 116,172 bridges on the NHS (including more than 55,000 Interstate System bridges), 6,175 NHS bridges are structurally deficient. Almost one-half of these structurally deficient NHS bridges are bridges on the Interstate Highway System (2,830 structurally deficient Interstate System bridges).

According to DOT, more than \$32.1 billion of investment would be required, by all levels of government, to eliminate the NHS bridge investment backlog. This figure includes \$19.1 billion for the Interstate Highway System bridges.<sup>5</sup>

#### BRIDGE INSPECTION STANDARDS

In December 1967, the Silver Bridge, which ran between Point Pleasant, West Virginia and Gallipolis, Ohio, collapsed, killing 46 people. The following year, Congress passed the Federal-Aid Highway Act of 1968, which established the National Bridge Inspection Program (NBIP), and directed DOT to work with the States to establish national bridge inspection standards designed to locate and evaluate existing bridge deficiencies to ensure the safety of highway bridges. The Act required DOT to establish inspection criteria and procedures, and inspector training and qualification requirements. The Act also required States to prepare and maintain an inventory of Federal-Aid Highway system bridges.

In 1971, DOT published the National Bridge Inspection Standards ("NBIS") in the Federal Register. Under the NBIS, States are required to conduct routine inspections on each bridge at least once every 24 months. Information is collected documenting the conditions and composition of the structures. The periodic inspections determine the adequacy of the structure to service the current demands for structural and functional purposes. Each State's Department of Transportation performs bridge inspections. This information is maintained in the National Bridge Inventory maintained by the Federal Highway Administration ("FHWA").

The Surface Transportation Assistance Act of 1978 expanded the NBIS to include bridges on all public roads, including bridges not on the Federal-Aid Highway system. With an expanded inventory of bridges to be inspected, FHWA decided to lengthen the time between inspections. In 1988, the FHWA issued regulations extending inspection intervals for certain bridges based on findings and analysis from previous inspections. The inspection interval for these bridges may not exceed once every 48 months. However, States are still required to conduct routine inspections on each bridge once every 24 months unless the state receives approval from FHWA to expand the inspection interval.

The Surface Transportation and Uniform Relocation Assistance Act of 1987 required additional inspection requirements for components that are critical to the safety of the structure.

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<sup>5</sup> U.S. Department of Transportation, *2006 Status of the Nation's Highways, Bridges, and Transit: Conditions & Performance*, January 22, 2007, p. 12-12, 11-17.

This included fracture critical members and underwater structures.<sup>6</sup> Inspections for underwater structures must occur once every 60 months. Under the 1988 rulemaking, the FHWA may extend the inspection interval for certain underwater structures based on findings and analysis from previous inspections. The inspection interval for underwater structures may not exceed once every 72 months.

The Secretary uses funds made available for the U.S. DOT's administrative expenses and the Surface Transportation Research Program to implement the NBIS highway bridge inspection program. Bridge inspection activities are also eligible under the Highway Bridge Program.

#### HIGHWAY BRIDGE PROGRAM

The Highway Bridge Program provides funding to enable States to improve the condition of their highway bridges through replacement, rehabilitation, and systematic preventive maintenance. The program is funded by contract authority, and subject to an overall Federal-aid obligation limitation. The apportioned funds are distributed according to a formula based on each State's relative share of the total cost to repair or replace deficient highway bridges.

Federal assistance for the replacement of bridges was originally included in the Federal-Aid Highway Act of 1970, which contained the Special Bridge Replacement Program ("SBRP"). The SBRP required DOT to inventory all bridges located on the Federal-aid system over waterways and other topographical barriers, classify these bridges, and prioritize the bridges by need of replacement. DOT would approve state applications for bridge replacement funds based on this inventory and classification. Subsequent Federal-Aid Highway Acts extended the SBRP.

The Surface Transportation Assistance Act of 1978 renamed the program the Highway Bridge Replacement and Rehabilitation Program. This legislation also made bridge repair and rehabilitation eligible to receive Federal funding.

The current surface transportation authorization, the Safe, Accountable, Flexible, Efficiency Act: A Legacy for Users ("SAFETEA-LU") changed the name to the Highway Bridge Program, and authorized the following amounts to be apportioned to the States.

Year	2005	2006	2007	2008	2009
Authorization*	\$4,188 M	\$4,254 M	\$4,320 M	\$4,388 M	\$4,457 M

Authorizations shown here will be augmented by a portion of the Equity Bonus Program funds.

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<sup>6</sup> Fracture critical members are bridge components "whose failure will probably cause a portion of or the entire bridge to collapse." U.S. Department of Transportation, Federal Highway Administration, "National Bridge Inspection Standards," 53 Federal Register, August 26, 1988, p. 32616.

Current eligible uses of Highway Bridge Program funds are:

- Replacement of a structurally deficient or functionally obsolete highway bridge on any public road with a new facility constructed in the same general traffic corridor.
- Rehabilitation to restore the structural integrity of a bridge on any public road, as well as the rehabilitation work necessary to correct major safety (functional) defects.
- Replacement of ferryboat operations in existence on January 1, 1984, the replacement of bridges destroyed before 1965, low-water crossings, and bridges made obsolete by U.S. Army Corps of Engineers flood control or channelization projects and not rebuilt with Corps funds.
- Bridge painting, seismic retrofitting, systematic preventive maintenance, calcium magnesium acetate applications, sodium acetate/formate, or other environmentally acceptable, minimally corrosive anti-icing and de-icing compositions or installing scour countermeasures.
- Deficient highway bridges eligible for replacement or rehabilitation must be over waterways, other topographical barriers, other highways, or railroads. The condition of bridges may also be improved through systematic preventative maintenance.

#### STATE TRANSFERS AND RESCISSIONS OF HIGHWAY BRIDGE PROGRAM FUNDS

The Federal-Aid Highway program provides States with some degree of funding flexibility among most apportioned programs. Beginning with the passage of the Intermodal Surface Transportation Efficiency Act ("ISTEA") in 1991, States were allowed to transfer up to 40 percent of Bridge funds to National Highway System ("NHS") or Surface Transportation Program ("STP") apportionments. The Transportation Equity Act for the 21<sup>st</sup> Century ("TEA 21") increased the percentage of Bridge funds that may be transferred to NHS or STP apportionments to 50 percent. Between 1992 and 2006, States have transferred a total of \$4.73 billion in Highway Bridge Program funds to NHS and STP programs.

Similarly, in implementing congressionally mandated rescissions of unobligated contract authority balances in highway program funds, States have chosen to disproportionately rescind contract authority from a few programs, including the Highway Bridge Program. Although the Highway Bridge Program represents approximately 11 percent of the overall program funding level in SAFETEA-LU, rescissions of contract authority available for this program have totaled approximately one-third of total rescissions.

### Bridge Program Rescissions

Fiscal Year	Total Fiscal Year Rescission	Bridge Program Rescissions	Percentage of Total
FY 2007	\$3.47 billion	\$1.04 billion	29.83%
FY 2006	\$3.85 billion	\$1.18 billion	30.72%
FY 2005	\$1.26 billion	\$425.1 million	33.72%
FY 2004	\$207.0 million	\$68.5 million	33.07%
FY 2003	\$250.0 million	\$89.0 million	35.61%

### LOAD RATINGS AND POSTINGS ON STRUCTURALLY DEFICIENT BRIDGES

Deteriorating conditions on deficient bridges results in facilities being “load rated”. The load rating is an estimate of the weight-carrying capacity of a bridge and is performed separately from the bridge inspection.<sup>7</sup> Properly calculating the load rating of structurally deficient bridges, and, if necessary, posting signs to keep heavier vehicles from crossing them, serves to protect structurally deficient bridges from powerful stresses caused by loads that exceed a bridge’s capacity.

In the 2006 audit, the DOT Inspector General (“DOT IG”) found that States erred in calculating the load rating for structurally deficient bridges on the NHS. According to the DOT IG, inaccurate or outdated maximum weight limit calculations and posting entries were recorded in bridge databases of the state departments of transportation and the National Bridge Inventory. The DOT IG projects that among structurally deficient bridges on the NHS:

- one of 10 structurally deficient NHS bridges had load rating calculations that did not accurately reflect the condition of the structure;
- signs were not posted on 7.8 percent of bridges that were required to have maximum safe weight signs posted; and
- procedures were not properly followed in the calculation of load ratings for 10 percent of the bridges.<sup>8</sup>

The DOT IG also found that FHWA Division Offices did not ensure that States’ bridge load ratings were properly calculated and corresponding postings were performed. In addition, FHWA does not require its Division Offices to analyze bridge inspection data to better identify and target specific structurally deficient bridges most in need of load limit recalculation and posting.<sup>9</sup>

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<sup>7</sup> U.S. Department of Transportation Inspector General, *Audit of Oversight of Load Ratings and Postings on Structurally Deficient Bridges on the National Highway System*, MH-2006-043, March 21, 2006, p. 3.

<sup>8</sup> *Id.*, p. 6.

<sup>9</sup> *Id.*, p. 13.



The Committee on Transportation and Infrastructure website has U.S. Department of Transportation maps of the structurally deficient bridges on the National Highway System in each State and Congressional District. See <http://transportation.house.gov/>.